The New Star in Auriga.   By S. W. Burnham, M.A.

My observations of Anderson's new star in *Auriga*, which connected it by micrometrical measures with all of the stars within a radius of about 2′, have been given in *Monthly Notices* for April 1892. These measures were principally made while the new star was as bright as the sixth magnitude. After it had fallen to the eighth magnitude, I commenced a series of observations with a view of ascertaining its magnitude, and the ratio of
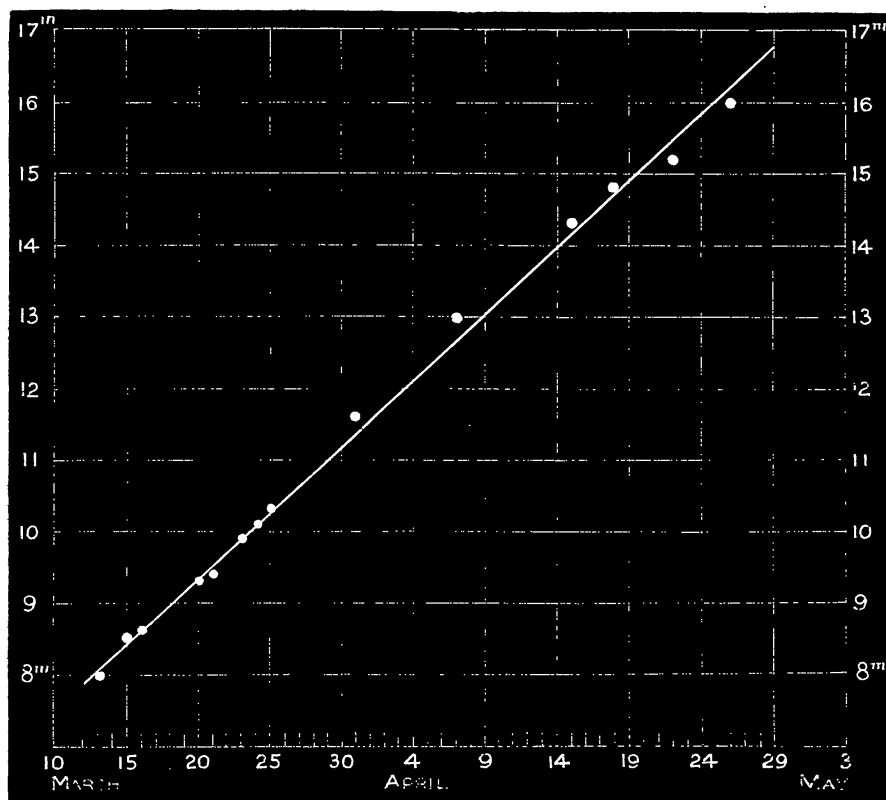
Observed Magnitudes of the New Star in *Auriga.*

diminution, during the time of its change, or so long as it might be visible with the large refractor of the Lick Observatory. I observed it on every available occasion until it was so low in the west in the early part of the evening that further comparisons would have little or no value.

For the lower magnitudes I have used for comparison the same stars which had been measured previously, and have adopted the magnitudes there given in determining that of the new star, with the single exception of the nearest companion, B. When the measures were made, the new star was a naked-eye object, and this faint companion at a distance of only 33″ was seen with considerable difficulty. The mean of the several estimates gave 14·8 for the magnitude of B. A careful examination of this star when the *Nova* had retrograded so that its light

could no longer affect the apparent brightness of the other, led me to think that this assigned magnitude was too small by about half a magnitude, and that it should be called 14 3. In the comparisons this value is used. I saw no reasons for changing the magnitudes previously given of the other companions.

In the following table I give the dates of the observations, the comparison stars used, the letters referring to the stars previously measured, and the deduced magnitude of the new star.

Observed Magnitudes of the New Star in Auriga.

Mar. 13	D. M. (30°) 942	8·0
15	„ „ 913, 924, 942	8·5
16	„ „ 913	8·6
20	„ „ 913, 924	9·3
21	„ „ 924	9·4
23	F	9·9
24	E, F, L, N	10·1
25	L	10·3
31	E, G, F	11·6
Apr. 7	E, G, I, J, B, K	13·0
15	B	14·3
18	B, C, *e*	14·8
22	B, C	15·3
26	B, C	16·0

The date last mentioned is the last time the new star was looked for. It was at that time very faint, and seen with considerable difficulty, but the conditions were not favourable. If the light continued to diminish as it had done throughout the observations, it was evident that, if it could be seen at all on any subsequent night, the estimates under the circumstances would have no value.

These observations are laid down on the accompanying diagram. It will be seen that the change in brightness from the eighth to the sixteenth magnitudes was perfectly uniform throughout. The divergences shown on the diagram are much within the ordinary errors of observation, and it is therefore safe to assume that the decline in brightness between these limits was without any sensible variation. This being true, there was every reason for supposing that the new star would go down steadily until it reached a point below the limit of the large telescope, and it is probable that this decline actually took place; but it could hardly have been anticipated that the star would again increase in brightness, and become a comparatively bright object in the course of a few months. It is unfortunate that it could not have been followed with the 36-inch until the

minimum brightness was reached, or until it was certainly beyond the reach of that instrument. In the scale of magnitudes employed here, that limit would have been reached in about a week from the date of the last observation. As the observations show that no change occurred in the rate of decrease while the star passed from the eighth to the sixteenth magnitude, and as it is probable that this movement would not be suddenly arrested, it is fair to presume that the new star became much fainter than the seventeenth magnitude, and passed far beyond the reach of any telescope.

It is also to be regretted that it was not examined earlier when it was again observable in the east. At this time, in the latter part of August, it seems to have reached about $10\frac{1}{2}$ magnitude. This was followed by the important discovery by Professor E. E. Barnard, on the night of August 20, that it was no longer a star, but was a small bright nebula with a nucleus of about the tenth magnitude. The nebulous character of the object was seen at once by this experienced observer, with the ordinary micrometer eyepieces of the large equatoreal. The spectroscopic observations at Mount Hamilton and elsewhere have since shown a corresponding change in the spectrum.

I have been able to examine this star once since its reappearance. On the morning of September 6 it was observed by Professor George E. Hale and myself with the 12-inch of the Kenwood Observatory. At this time it was a little brighter than F, the comparison giving for the magnitude of the new star 10·2.

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  October 17.

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The Binary Star Σ 1785. By S. W. Burnham, M.A.

This binary has now passed over 84° of position-angle since the measures of Struve in 1830; and the data are now sufficient for an approximate determination of the elements of the orbit. During this time the distance has been steadily diminishing. It was discovered by South, who measured it in 1823 on a single night. His distance is nearly $2''$ too large, as will appear from a comparison with the later measures of Struve and others. It is evident that the period is a very long one, and that the angular change for some time to come will be comparatively rapid. It is therefore desirable that this pair should be measured every year or two for the present.

To facilitate the computation of the orbit, I have made a careful collection, from the original sources, of all the measures, and give them below in chronological order. The last observa-